NON-PUBLIC?: N
ACCESSION #: 9310150195
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Limerick Generating Station, Unit 1 PAGE: 1 OF 10

DOCKET NUMBER: 05000352

TITLE: Partial Loss of Offsite Power that Resulted in a Unit 1
SCRAM and Various ESF Actuations on Unit 1, Unit 2, and
Common Systems.
EVENT DATE: 09/07/93 LER #: 93-011-00 REPORT DATE: 10/07/93

OTHER FACILITIES INVOLVED: Limerick, Unit 2 DOCKET NO: 05000353

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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Assessment, LGS

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On September 7, 1993, a loss of one of the two independent station offsite power supplies occurred. The 10 Station Auxiliary Bus Feeder Breaker opened and locked out due to an overcurrent condition when a bus feeder cable was struck during excavation work. All affected electrical buses transferred. The partial loss of power caused several Engineered Safety Feature actuations including fast starts of four Emergency Diesel Generators. The Unit 1 D114-G-D Feeder Breaker failed to reclose. The D114-G-D Feeder Breaker failure caused a Unit 1 Feedwater System anomaly which resulted in a reactor SCRAM on low water level. All safety systems functioned as designed. Unit 2 continued to operate at full power. The root causes of the 10 Station Auxiliary Bus trip are inadequate control of non-routine work processes, unclear supervision and worker expectations, and inadequate control of excavations including inadequate

shoring procedural guidance. A primary casual factor of the Unit 1 reactor SCRAM was the Feeder Breaker failure. Corrective actions include the establishment of an excavation coordinator, a revision to the excavation procedure, the communication of management expectations, and a Feeder Breaker Diagnostic Testing Program.

END OF ABSTRACT

Unit Conditions Prior to the Event:

The Unit 1 and Unit 2 reactors were in Operational Condition 1 (Power Operation) operating at 100% power level.

Description of the Event:

On September 7, 1993, at 1432 hours, Limerick Generating Station (LGS) experienced a loss of one of the two independent station offsite power supplies when the 10 Station Auxiliary Bus (EIIS:SSBU) Feeder Breaker (EIIS:BKR) opened and locked out due to a 'C' phase differential overcurrent condition.

As a result of the loss of the 10 Station Auxiliary Bus, a 101 Safeguard Bus undervoltage condition occurred. All plant safeguard buses normally aligned to the 101 Safeguard Bus (i.e., D11, D13, D22, and D24) successfully fast transferred to the redundant 201 Safeguard Bus. The four Emergency Diesel Generators (EDG, EIIS:EK) associated with the 4 KV Safeguard Buses originally fed from the 101 Safeguard Bus successfully started and ran unloaded. Refer to Figure 1. The EDG starts are Engineered Safety Feature (ESF) actuations.

Following the loss of the 10 Station Auxiliary Bus, Main Control Room (MCR) Operations personnel observed a Unit 1 reactor Feedwater System (FWS, EIIS:SJ) anomaly resulting in slowly decreasing reactor level. Before MCR Operation personnel could reduce power or control FWS operation, a Unit 1 reactor SCRAM occurred at 1433 hours as a result of the Reactor Protection System (RPS, EIIS:JD) actuation. MCR Operations personnel executed the appropriate emergency response procedures to restore reactor level and stabilize the plant in a shutdown condition. Unit 1 reactor vessel water level momentarily decreased to -36 inches. The reference zero reactor vessel water level is 161 inches above the top of active fuel and normal water level is +35 inches. No Emergency Core Cooling Systems actuated, nor were any required to actuate.

At approximately 1437 hours, during review of AC electrical power supply parameters, MCR Operations personnel observed the failure of the Unit 1 D114-G-D Motor Control Center (MCC) Feeder Breaker to reclose following the reenergization of the D11 Safeguard Bus. Operations personnel immediately reclosed the MCC Feeder Breaker.

At approximately 1900 hours, upon station personnel identification of a potential correlation between excavation activities being performed for fire hydrant no. 5 and the trip of the 10 Station Auxiliary Bus, all station excavation activities were terminated.

As a result of the trip of the 10 Station Auxiliary Bus, the following ESFs also occurred:

1. A MCR ventilation isolation and Control Room Emergency Fresh Air System (CREFAS, EIIS:VI) initiation occurred due to the loss of power to the 'A' and 'C' chlorine detectors.

2. Actuation of a portion of the Primary Containment and Reactor Vessel Isolation Control System (PCRVICS, EIIS:JM) resulted in an isolation signal to the previously-closed Unit 1 and Unit 2 Primary Containment purge supply and exhaust valves. This isolation signal occurred due to a loss of power to the North Stack Wide Range Accident Monitor (WRAM) isolation logic.

As a result of the abnormal FWS operation, a partial PCRVICS isolation occurred resulting in isolation of Division 1 and 3 Primary Containment sampling and recombiner valves and Division 3 Secondary Containment bypass leakage barrier block and vent valves due to a sensed low low reactor water level (nominally -38 inches).

At 1453 hours, Operations personnel returned the MCR ventilation to normal operation. At 1503 hours, operations personnel reset the Unit 1 SCRAM. At 1534 hours, the PCRVICS isolations were reset. At 1556 hours, restoration of the EDGs was completed.

Following recovery from the SCRAM, the plant continued into a shutdown condition to accommodate forced outage activities. These activities included the bus feeder cable repair, a Unit 1 reactor vessel level instrumentation modification (i.e., NRC Bulletin No. 93-03), and a D11 Safeguard Bus electrical outage. At 2321 hours on September 11, 1993, MCR Operations personnel restarted the Unit 1 reactor. The plant was shutdown for approximately four days.

Unit 2 electrical buses and loads transferred as designed and the reactor remained at 100% of rated thermal power throughout this event.

A four hour notification was made to the NRC at 1737 hours on September 7, 1993, in accordance with the requirements of 10CFR50.72(b)(2)(ii), since this event resulted in automatic RPS and ESF actuations. This LER is being submitted in accordance with the requirements of 10CFR50.73(a)(2)(iv).

Analysis of the Event:

All safety-related systems functioned as designed in response to the trip of the 10 Station Auxiliary Bus. All safety-related AC electrical power supply systems performed per design. The D114-G-D MCC Feeder Breaker performed its safety-related isolation function per design. The MCC Feeder Breaker, however, failed to perform its non-safety reclosure function. The Unit 1 reactor FWS performed per design in response to the D114-G-D MCC Feeder Breaker reclosure failure. The FWS could not have prevented a low (level 3) reactor level SCRAM with the D114-G-D MCC Feeder Breaker reclosure failure. The consequence of a reactor SCRAM, therefore, is expected in light of the respective system designs. There was no release of radioactive materials to the environment as a result of this event.

Post-trip equipment review of the D114-G-D MCC Feeder Breaker indicated proper undervoltage actuation. The D114-G-D MCC Feeder Breaker, however, failed to reclose following reenergization of the D11 Safeguard Bus.

The D114-G-D MCC supplies various non-safety related loads in the Unit 1 Turbine Building. An actuating relay automatically trips the breaker mechanism on a Loss of Offsite Power (LOOP) signal (undervoltage) per design. The control circuit is designed to reclose the breaker mechanism automatically upon respective Safeguard Bus voltage restoration provided no Loss of Coolant Accident (LOCA) signal is present. An operator can also use the control circuit via handswitch to reclose the breaker mechanism manually. During the event, the operator appropriately utilized this handswitch to manually reclose the D114-G-D MCC Feeder Breaker.

The Unit 1 Safeguard Bus fast transfer and the D114-G-D MCC Feeder Breaker reclosure failure prevented both the '1A' Reactor Feedwater Pump (RFP) and the '1C' RFP from responding to reactor level changes. The '1A' RFP Motor Control Unit (MCU) remained deenergized due to the D114-G-D MCC Feeder Breaker reclosure failure. The '1C' RFP Control

Signal Failure Interlock initiated due to the deenergization of the RFP Motor Gear Unit (MGU) in response to the Unit 1 Safeguard Bus fast transfer. Further, the Unit 1 Safeguard Bus fast transfer caused an instantaneous deenergization of the Feedwater Level Control Logic. The instantaneous deenergization of the Feedwater Level Control Logic caused the input to the Master Controller to fail downscale. This downscale failure caused the Master Controller output to the individual RFPs to saturate upscale. Additionally, the D114-G-D MCC Feeder Breaker reclosure caused the condensate recirculation valve to fail open. This opening caused reduced RFP

suction pressure which further impaired RFP response. The '1B' RFP attempted to respond to reactor level changes independently; however, the '1B' RFP could not maintain normal reactor level. The result was a low level (level 3) reactor SCRAM.

Cause of the Event:

The Loss of the 10 Station Auxiliary Bus was due to the ongoing excavation evolution. The overcurrent condition occurred while a station work group was performing excavation activities in support of a shoring installation. The primary causal factors of the trip of the 10 Station Auxiliary Bus are less than adequate control of nonroutine work processes, unclear supervision and worker expectations, and less than adequate control of excavations including inadequate shoring procedural guidance.

On August 9, 1993, a contractor work group started scheduled excavation to repair a fire protection system pipe leak associated with fire hydrant no. 5. Refer to Figures 2 and 3. By August 26, 1993, the contractor work group had completed all excavation work with only trench backfilling work remaining. On August 27, 1993, the contractor work group was relieved by a station work group. On September 7, 1993, the station work group utilized a backhoe to 'square off' the excavated trench to assist in the upgrading of existing shoring. During the trench rework, damage to the 10 Station Auxiliary Bus 'C' phase cable occurred.

The initiation of the trench rework was beyond the normal responsibilities and training of the station work group. The station work group supervision and workers, however, did not realize that the change in job scope was outside their area of qualification and authority, and that insufficient work instructions existed. Additionally, the excavation program, including shoring procedural guidance, did not provide adequate controls to ensure this type of work

is performed by the appropriate qualified personnel with adequate work instructions. Finally, the shoring installed by the contractor work group and inspected by the station safety group was inadequate. The station safety instruction for shoring did not provide the level of detail needed to comply with the corporate policy for shoring.

Corrective Actions:

1. On September 8, 1993, a letter to all Station Supervisors from the LGS Vice President was issued to announce the establishment of a designated station excavation coordinator. This letter requires all current and future excavation activities be authorized by the Contract Services Manager. The Contract Services Manager will serve as the designated station excavation coordinator until station individuals are qualified and authorized to be excavation/shoring coordinators.

2. An "All Hands" meeting was conducted on September 20, 1993, for the station Support Services Division, with a clear discussion on open communication between the worker and supervision and the expectation that a worker in any circumstance shall not proceed beyond their abilities or exceed administrative controls.

3. Installation Procedure IP 5.16 "Procedure for Performing Excavation and Providing High Voltage/HV Overhead Clearance Requirements," was revised, to cover shoring instructions, assignment of excavation shoring coordination, and training and qualification for appropriate station individuals. Additionally, Administrative Guideline AG-45.6, "Maintenance Work Planning," was revised, to require the usage of procedure IP 5.16 to ensure that a competent excavation/shoring coordinator is assigned for all station excavation/subsurface activities. Finally, the station Safety Instruction 3-11 for shoring was revised to provide detail consistent with the corporate policy for shoring.

4. A letter from the LGS Vice President has been issued to all station supervision to reinforce the expectation on work control adherence. This letter also included information about adequacy of turnovers, working within the authorized scope, training and qualification requirements, necessity of establishing clear division of responsibility of tasks, the necessity of having proper work instructions in-hand, and the priority regarding quality of work versus schedule. A follow-up "For Your Information (FYI)" Bulletin will be issued by October 18, 1993, to further communicate these

expectations.

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5. Although the cause of the D114-G-D MCC Feeder Breaker reclosure failure is indeterminate, the MCC Feeder Breaker reclosure control circuit components were replaced to increase reliability. Further, a Breaker Diagnostic Testing Program has been established for the purpose of verifying the continued proper Feeder Breaker control circuit operation of both similar Unit 1 Feeder Breakers D114-G-D and D124-G-D, and the similar Unit 2 Feeder Breakers D214-G-D and

D224-G-D.

Previous Similar Occurrences:

No previous reactor SCRAMs have occurred on either unit at LGS as a result of the cause of this event.

Previous non-reportable events at LGS involving excavation concerns have occurred and resulted in enhanced excavation controls. However, these controls were not being utilized by the station work group during the event reported in this LER. The previous corrective actions therefore are not expected to have prevented this event.

Two similar breaker reclosure failures have occurred at LGS but both failures were attributable to specific component failures. No component failures, however, were discovered during the investigation of the event reported in this LER.

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Figure 1 "Limerick Generating Station Single Line Diagram" omitted.

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Figure 2 omitted.

TEXT PAGE 10 OF 10

Figure 3 "Hydrant #5 Trench Excavation Cut Away" omitted.

ATTACHMENT 1 TO 9310150195 PAGE 1 OF 1

10CFR 50.73

PHILADELPHIA ELECTRIC COMPANY

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October 07, 1993
Docket Nos. 50-352
50-353
License Nos. NPF-39
NPF-85

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Licensee Event Report
Limerick Generating Station Units 1 & 2

This LER concerns a partial loss of offsite power event that resulted in a Unit 1 reactor SCRAM (a Reactor Protection System actuation), and various Engineered Safety Feature actuations on Unit 1, Unit 2, and common systems. The partial loss of offsite power occurred as a result of excavation work which damaged an offsite power supply. The transient was complicated by a breaker that failed to reclose which adversely affected normal operation of the Unit 1 Feedwater System controls that led to the Unit 1 reactor SCRAM.

Reference: Docket Nos. 50-352
50-353
Report Number: 1-93-011
Revision Number: 00
Event Date: September 7, 1993
Report Date: October 07, 1993
Facility: Limerick Generating Station
P.O. Box 2300, Sanatoga, PA
19464-2300

This LER is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(iv).

Very truly yours,

GCG/DMS:cah

cc: T. T. Martin, Administrator Region I, USNRC
N. S. Perry, USNRC Senior Resident Inspector, LGS

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